REMARKS/ARGUMENTS

Claims 1-71 were pending in this application at the time the present Office Action was mailed. Claims 1, 20 and 41 have been amended and claims 19, 36 and 52-71 have been canceled. Accordingly, claims 1-18, 20-35, and 37-51 are now pending in this application.

In the Office Action dated November 6, 2002, claims 1-71 were rejected. More specifically, the status of the application in light of this Office Action is as follows:

(I) The rejection of the claims was made final;

(II) Claims 1-71 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,218,309 to Miller et al. ("Miller") in light of U.S. Patent No. 5,567,300 to Datta et al. ("Datta").

I. Response to the Finality of the Rejections

Applicant respectfully submits that the finality of the present Office Action is premature. In particular, claim 1 was previously rejected under 35 U.S.C. § 102 in light of Miller, and now stands rejected under 35 U.S.C. § 103 in light of Miller in combination with Datta, despite the fact that claim 1 was not amended in the previous response. The MPEP provides at § 706.07(a) that a second or any subsequent action on the merits "will not be made final if it includes a rejection, on newly cited art . . . of any claim not amended by applicant or patent owner in spite of the fact that other claims may have been amended to require newly cited art." Accordingly, applicant respectfully submits that the finality of the present Office Action should be withdrawn.

II. Rejections under 35 U.S.C. § 103

A. The Invention

Aspects of the invention are directed toward methods for processing a microelectronic substrate with an electrolytic fluid. By passing an electrical current through the electrolytic fluid to the microelectronic substrate, conductive material can

be removed from the substrate. In this manner, a corner formed by the conductive material can be rounded by electrolytically removing conductive material from the corner. In one aspect of the invention, the conductive material can be preferentially removed from the corner. Then, as the conductive material is removed from the corner, less electrical current can be attracted to the corner to slow the rate at which the conductive material is removed from the corner. Accordingly, the process can enhance corner rounding by preferentially removing material from the corner, and can then self-limit as the corner becomes rounded.

In particular, claim 1 is directed to a method for processing a microelectronic substrate, and includes disposing an electrolytic fluid adjacent to a conductive material of the substrate, with the conductive material having a corner between first and second surfaces. The method further includes preferentially removing at least part of the conductive material from the corner by positioning first and second electrodes in fluid communication with the electrolytic fluid and coupling at least one of the electrodes to a source of electrical potential. As the conductive material is removed from the corner, the method further includes attracting less electrical current to the corner to slow the rate at which the conductive material is removed from the corner. Accordingly, the method recited in claim 1 can achieve the benefits described above.

B. The Prior Art

Miller discloses a method of forming a trench in a silicon layer using a plasma etch process. The plasma etch process is used to round a corner at the top of the trench, forming a top rounded attribute 226 (Figure 3D) and a passivating film 228 that keeps the top rounded attribute 226 intact.

Datta discloses an electrochemical metal removal technique. The electrolyte used in Datta's method is made electrically resistive through the addition of non-conducting organic substances to increase the differential in etching rates between high and low areas, causing planarization of the metal surface.

C. Analysis

Claim 1 is patentable over the applied references because the references, alone or in combination, fail to disclose or suggest at least some of the features of claim 1. For example, neither Miller nor Datta disclose "preferentially removing at least part of the conductive material from the corner" with an electrolytic fluid and then "as the at least part of the conductive material is removed from the corner, attracting less electrical current to the corner to slow a rate at which the conductive material is removed from the corner". Miller's etch process does not disclose an electrolytic method for removing material from a conductive corner, nor does Miller provide any motivation to replace his plasma etch technique with an electrolytic removal technique, such as that disclosed by Datta. Even if, assuming for the sake of argument, Miller did provide such motivation, Datta fails to disclose or suggest the preferential removal and self limiting corner rounding features described above. Accordingly, claim 1 is patentable over the applied references and the Section 103 of claim 1 should be withdrawn.

Claims 2-18 depend from claim 1. Accordingly, these claims are patentable over the applied references for the reasons discussed above and for the additional features of these dependent claims.

Independent claims 20, 37 and 41 include many of the features described above with reference to claim 1. For example, independent claim 20 includes "preferentially removing at least part of the conductive material from the corner to at least partially blunt the corner by exposing the corner to an electrical potential via an electrolytic fluid" and "attracting less electrical current to the corner to reduce a rate at which the conductive material is removed from the corner" as "the at least part of the conductive material is removed from the corner." Independent claim 37 includes "oxidizing at least part of the conductive material at the corner by positioning first and second electrodes proximate to and spaced apart from the microelectronic substrate and in fluid communication with the electrolytic fluid", "removing at least part of the oxidized

material by exposing the oxidized material to an etchant" and "reducing a rate at which material is removed from the corner by rounding the corner to reduce a flow of electrical current from the at least one electrode to the corner." Independent claim 41 includes "forming a recess in a conductive material of the microelectronic substrate," "forming a conductive microelectronic feature in the recess," and "rounding the corner defined by the recess . . . via an electrolytic fluid." Claim 41 further recites "as the oxidized material is removed from the corner, attracting less electrical current to the corner to slow a rate at which material is removed from the corner." Accordingly, these independent claims are patentable over the applied references for the reasons discussed above and for the additional features of these independent claims.

Claims 21-35 depend from claim 20, claims 38-40 depend from claim 37, and claims 42-51 depend from claim 41. Accordingly, these claims are patentable over the applied references for the reasons discussed above and for the additional features of these dependent claims.

Claims 19, 36 and 52-71 have been canceled from the application and accordingly the Section 103 rejection of these claims is now moot.

III. Conclusion

In light of the foregoing amendments and remarks, all of the pending claims are in condition for allowance. Applicants, therefore, request reconsideration of the application and an allowance of all pending claims, as well as a withdrawal of the finality of the Office Action. If the Examiner wishes to discuss any aspects of the claims

or other portions of the application, the Examiner is encouraged to contact John Wechkin by telephone.

Respectfully submitted,
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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

1. (Amended) A method for processing a microelectronic substrate, comprising:

disposing an electrolytic fluid adjacent to a conductive material of the microelectronic substrate, the conductive material having a first surface in a first plane and a recess in the first surface, the recess being bounded by a second surface in a second plane, the conductive material further having a corner between the first and second surfaces; ~~and~~

preferentially removing at least part of the conductive material from the corner by positioning first and second electrodes in fluid communication with the electrolytic fluid and coupling at least one of the electrodes to a source of electrical potential; and

as the at least part of the conductive material is removed from the corner, attracting less electrical current to the corner to reduce a rate at which conductive material is removed from the corner.

20. (Twice Amended) A method for processing a microelectronic substrate, comprising:

disposing a generally non-conductive material adjacent to a conductive material of the microelectronic substrate;

forming a recess extending through the generally non-conductive material and into the conductive material, the recess defining a corner at least proximate to an interface between the conductive material and the generally non-conductive material; ~~and~~

preferentially removing at least part of the conductive material from the corner to at least partially blunt the corner by exposing the corner to an electrical potential via an electrolytic fluid; and

as the at least part of the conductive material is removed from the corner, attracting less electrical current to the corner to reduce a rate at which conductive material is removed from the corner.

41. (Twice Amended) A method for processing a microelectronic substrate, comprising:

forming a recess in a conductive material of the microelectronic substrate, the recess defining a corner at an intersection of the aperture and a plane of the conductive material;

forming a conductive microelectronic feature in the recess; and

controlling electromagnetic emanations from the conductive microelectronic feature by rounding the corner defined by the recess, wherein rounding the corner includes electrically coupling a source of electrical potential to the corner via an electrolytic fluid to oxidize the conductive material, ~~and~~ removing oxidized material from the corner by exposing the oxidized material to an etchant, and as the oxidized material is removed from the corner, attracting less electrical current to the corner to slow a rate at which material is removed from the corner.